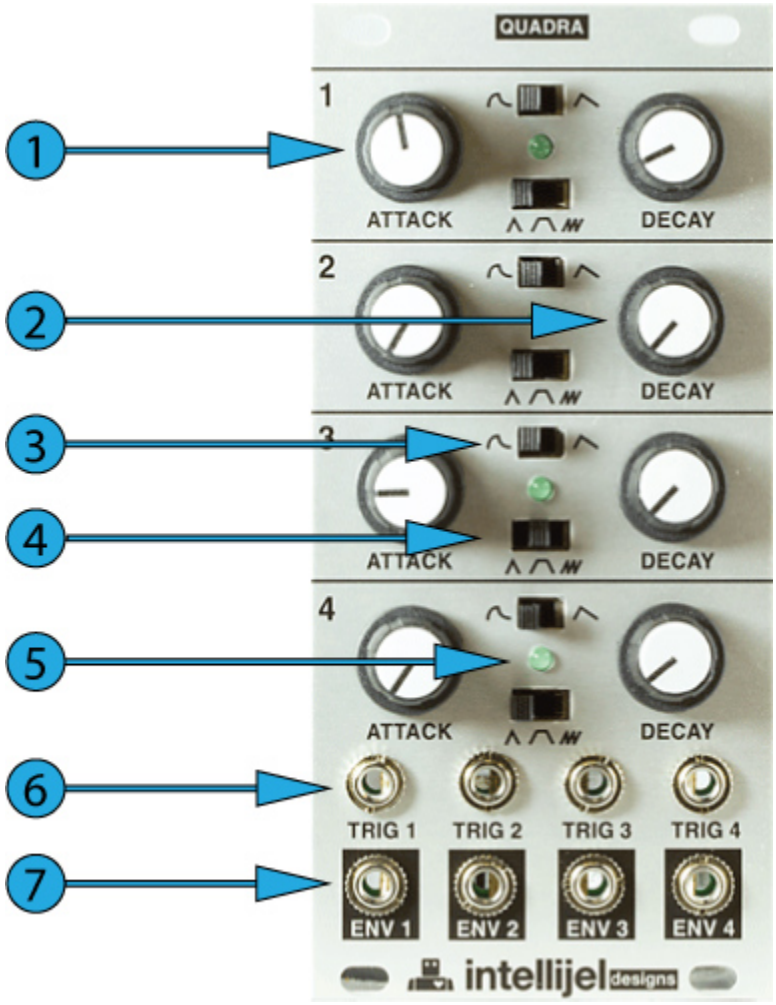
The Intellijel Quadra and Expander module comprises four parallel function generators (more commonly referred to as "Envelope Generators". The Quadra function generators have three modes, AD (Attack Decay), ASR (Attack Sustain Release) and Cycle (perpetually repeating AR envelope or unipolar LFO). Each function can be configured to have a linear or exponential curve and they feature a wide time base control from 0.5ms to over 30 seconds. The Expander enhances the core functionality by allowing attenuated voltage control over Attack and Decay for each function generator as well as a Quadrature mode and a analog OR mixer for each function generator pair (1-2, 3-4).

This manual will cover both the Quadra and its optional Expander module.

Quadra Front Panel



1- ATTACK – These knobs control the time of the Attack portion of the function (rising from 0 to the maximum level). Slower times will create a fade in effect while faster times are used for snappy percussive sounds.

2- DECAY- These knobs control the fall to zero time. If in ASR mode this will act as the Release time. In Cycle mode the total time of Attack and Decay set the frequency of the LFO.

3- Exponential/Linear switch. This will change the shape of the Attack and Decay sections. This setting will alter the time base of the function generator. Depending on what you are patching the Quadra into this setting may need to be changed. For example if patching into an exponential VCA you should use Linear mode. The fastest envelope times are achieved when in linear mode.

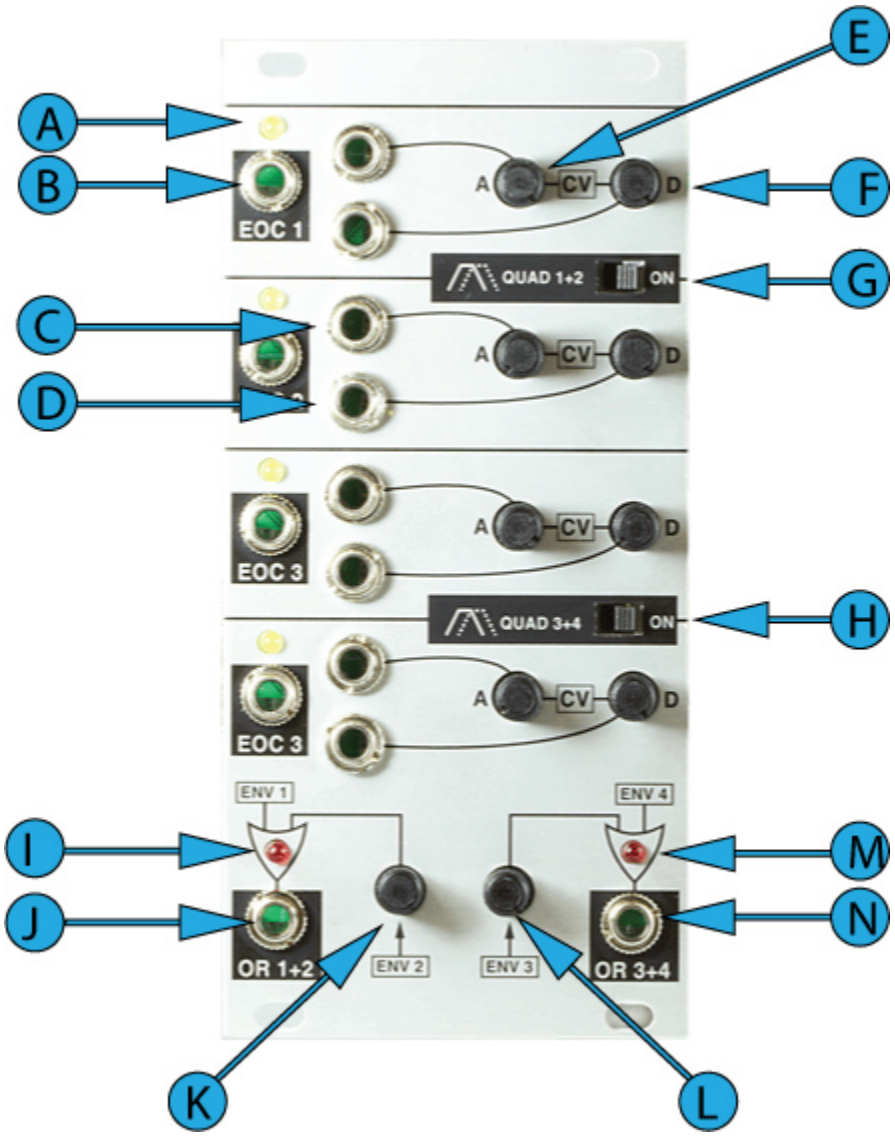
4- Mode switch. Selects AD, ASR or Cycle mode. AD is an envelope that ignores the incoming gate time and is simply triggered. This is often used with sequencers. ASR is similar to an ADSR in that it continues to sustain while the input gate is high and Cycle mode is like a LFO.

5- LED – shows the state of the function generator amplitude.

6- TRIG Inputs - Patch trigger or gate signals here to control the function generators.

7- ENV Outputs – The function generator is output here as a uniplolar 0-8v control signal.

Expander Front Panel



A- Yellow LED – These LEDs indicate when the respective function generator has reached the End of Cycle.

B- EOC – Outputs a high gate signal when the function generator is done its Decay phase.

C- Attack voltage control input with attenuator. This allows you to modulate the Attack time. Use the mini knob attenuator to dial in the range you desire. Since the time range of the Quadra is so wide you should start with the attenuator turned down to a low setting.

D- Decay Voltage Control input with attenuator.

E- Attack mini knob attenuator reduces the amount of voltage controlling via its respective input.

F- Decay mini knob attenuator reduces the amount of voltage controlling via its respective input.

G- Quad 1+2 mode switch. When on the EOA1 will trigger function generator 2. More on this later….

H- Quad 3+4 mode switch. See G

I- OR 1+2 LED

J- OR 1+2 Output. This is the OR mixed signal of 1+2. When using quadrature 1+2 mode use this output for complex function shapes.

K- Attenuator for the level of Env2 into OR 1+2

L- Attenuator for the level of Env3 into OR 3+4

M- OR 3+4 LED

K- Attenuator for the level of Env2 into OR 1+2

L- Attenuator for the level of Env3 into OR 3+4

M- OR 3+4 LED

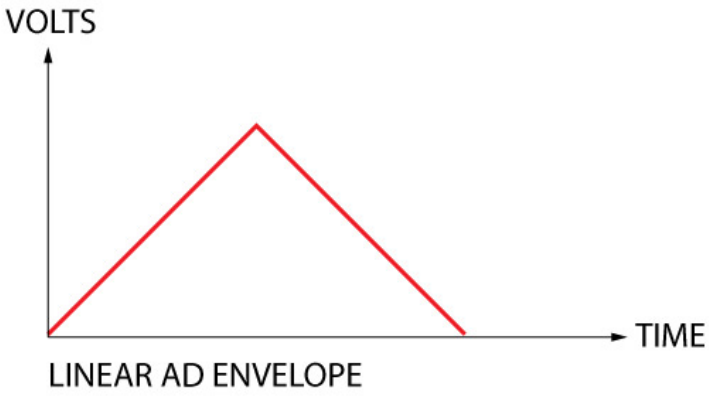
N- OR 3+4 Output. This is the OR mixed signal of 3+4. When using quadrature 3+4 mode use this output for complex function shapes.

What is it for?

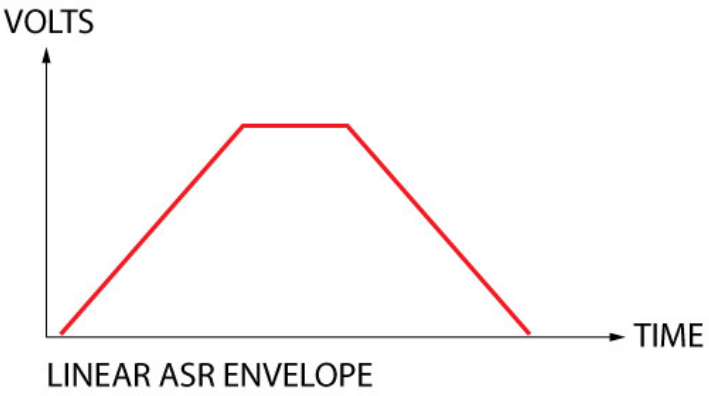
If you come from a more traditional synthesizer background all this talk of function generators and quadrature mode may seem overwhelming. Perhaps you find it strange that we talk about the Quadra as an Envelope Generator but then do not mention the envelope type you are familiar with, the ADSR. This is because the design concept of the Quadra is inspired by what is commonly referred to as “West Coast” synthesis concepts (a nod to Don Buchla, a pioneer in synth design from California). You can think of each function generator in the Quadra as a simple envelope generator . However since the Quadra can also create very complex looping LFO shapes in quadrature mode or create complex interacting combinations using the OR outputs we use the more traditional name of “Function Generator”.

You can use the Quadra on its own as four AD or ASR envelope generators. If you are not using a tradition keyboard controller AD mode is preferred by many since it is independent the incoming gate time. Once the AD is triggered it will move through its stages until completion. This is ideal for sequencer or random based patches. You can use the Expander VC inputs to control the decay time which is like controlling the gate time at the sequencer but has a different sound.

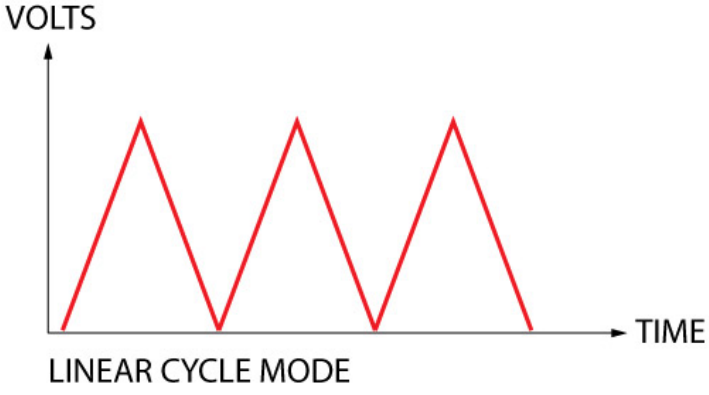
Why would you use so many envelopes? If you consider the average synthesizer voice needs at least two envelopes, one for final VCA, the other for filter cutoff it is not hard to imagine in a more complex voice how to use more. For example another AD envelope could be used to control the modulation index of a two VCO FM patch. You can use envelopes to control the amount a LFO controls the filter via another VCA or use a multed VCA in parallel with the final VCA to act as an effect send. You can see how with a little imagination and a lot of VCAs you will quickly run out of envelope generators, especially once you start designing percussive sounds.



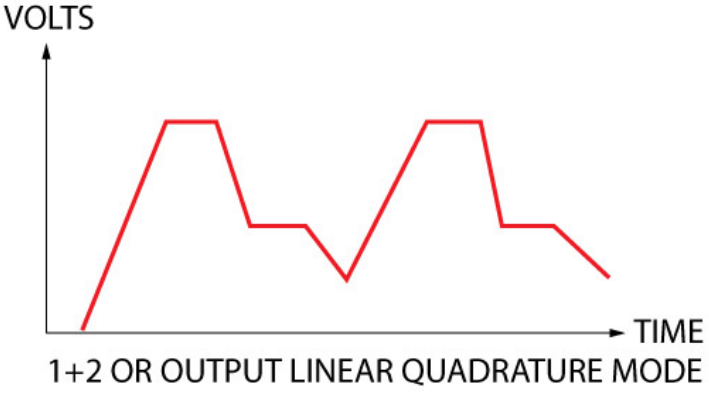
LINEAR AD ENVELOPE



LINEAR ASR ENVELOPE



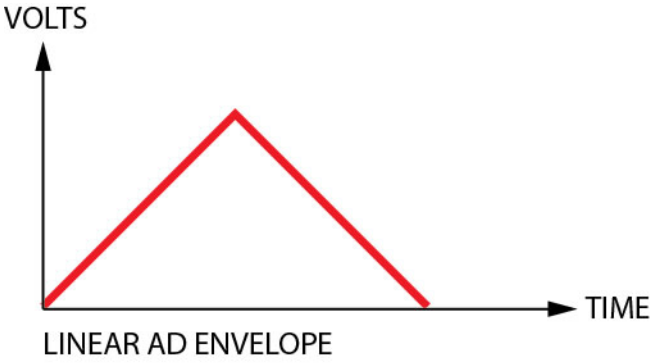
LINEAR CYCLE MODE



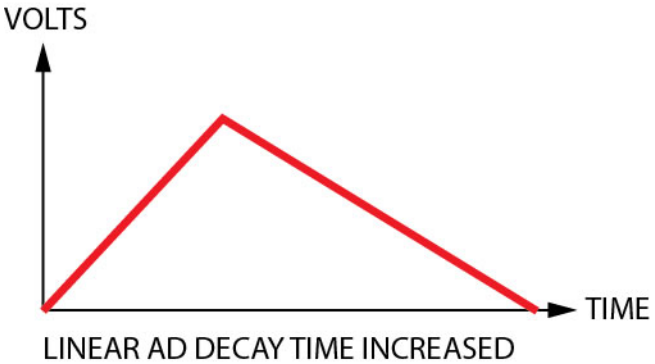
1+2 OR OUTPUT LINEAR QUADRATURE MODE

Linear vs Exponential shapes

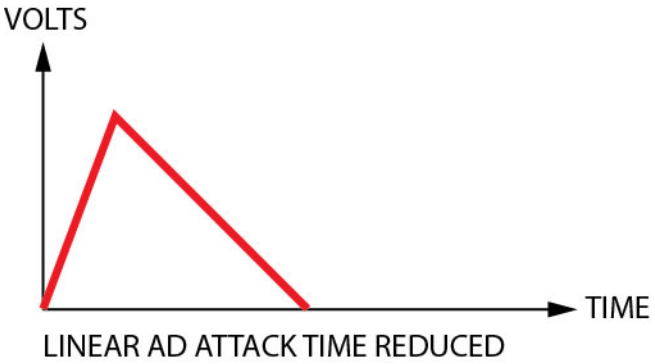
In Linear mode (switch to the left) the Quadra makes straight lines as shown below. This shape is best used with exponential VCAs.



LINEAR AD ENVELOPE

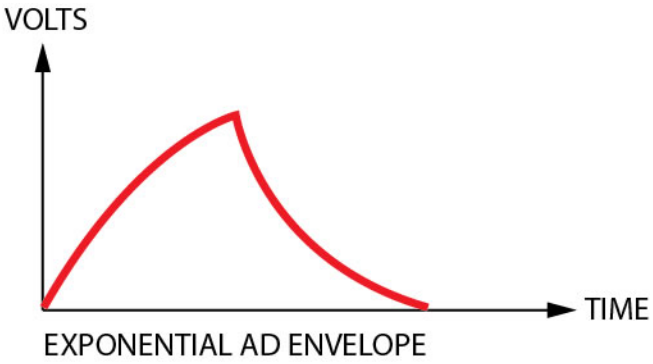


LINEAR AD DECAY TIME INCREASED

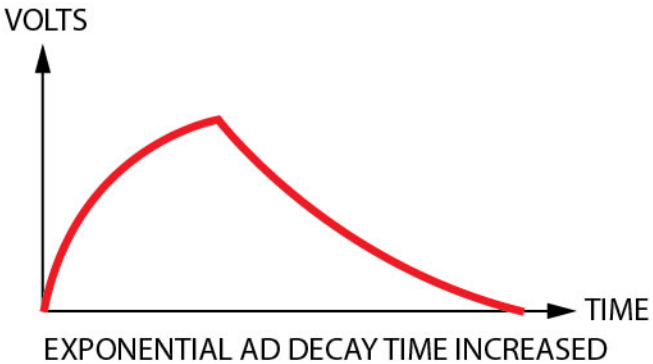


LINEAR AD ATTACK TIME REDUCED

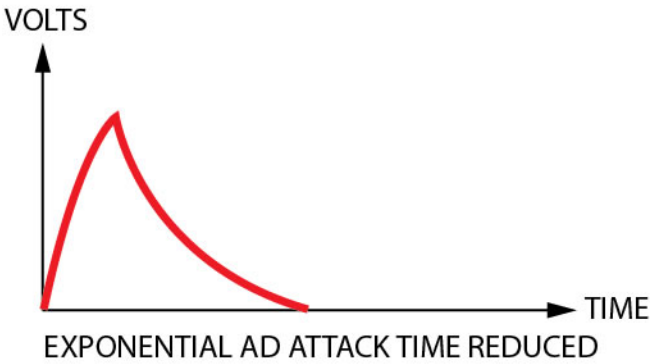
In Exponential mode the Quadra creates a musical curved shape found on many classic envelope generators. This is best used with linear VCAs.



EXPONENTIAL AD ENVELOPE



EXPONENTIAL AD DECAY TIME INCREASED



EXPONENTIAL AD ATTACK TIME REDUCED

Quadrature Mode Explained

Quadrature mode links the function generators into pairs of looping envelopes that are interdependent. It vaguely resembles two waveforms that are phase shifted 90 degrees relative to each other (hence the “quadrature” label). Each pair is independent and function identically so we will concentrate on the function generators 1+2 pair for this section.

The Quadra Expander has two modes that are selected via jumper on the rear of the module. The primary difference between these two modes is in what restarts their cycle. In Mode A the EOC1 retriggers the cycle while in Mode B EOC2 retriggers the cycle.

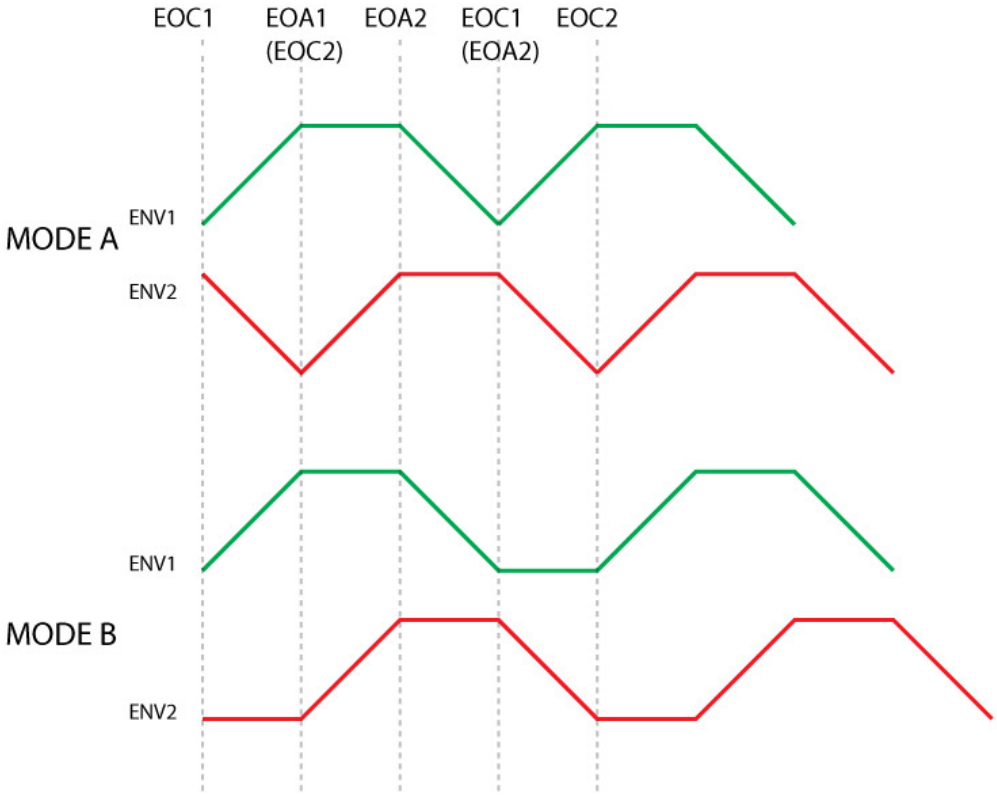
Mode A

When 1 is triggered it moves through its Attack phase, it then holds until 2 completes its Attack phase then 2 will sustain until 1 completes its Decay phase. The EOC1 then retriggers the envelope while envelope 2 will move continues to complete its Decay phase. Use the OR output for the resulting four stage function.

Mode B

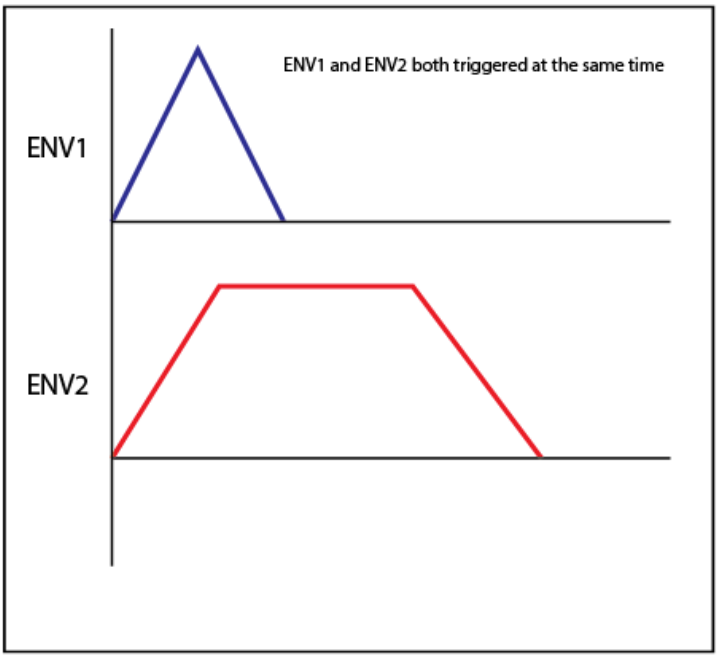
When 1 is triggered it moves through its Attack phase, it then holds until 2 completes its Attack phase then 2 will sustain until 1 completes its Decay phase, then finally 2 will move through its Decay phase. One the Decay phase of 2 is complete 1 is triggered and the whole sequence starts again. Use the OR output for the resulting four stage function.

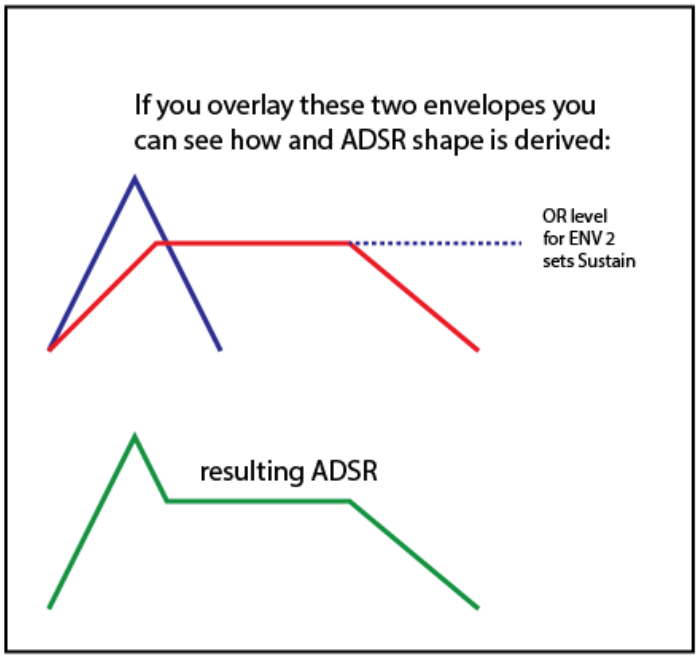
An interesting application of Mode B is that you can use duration of Envelope 2 to control the frequency of re-triggering of Envelope 1. If you set Envelope 2 so it had a an attack time of 0 then Env1 would become an AD envelope triggered at a rate determined by the decay time of Envelope 2. This can become very interesting for creating rhythmic patterns.



ADSR Envelope Generation (requires Expander)

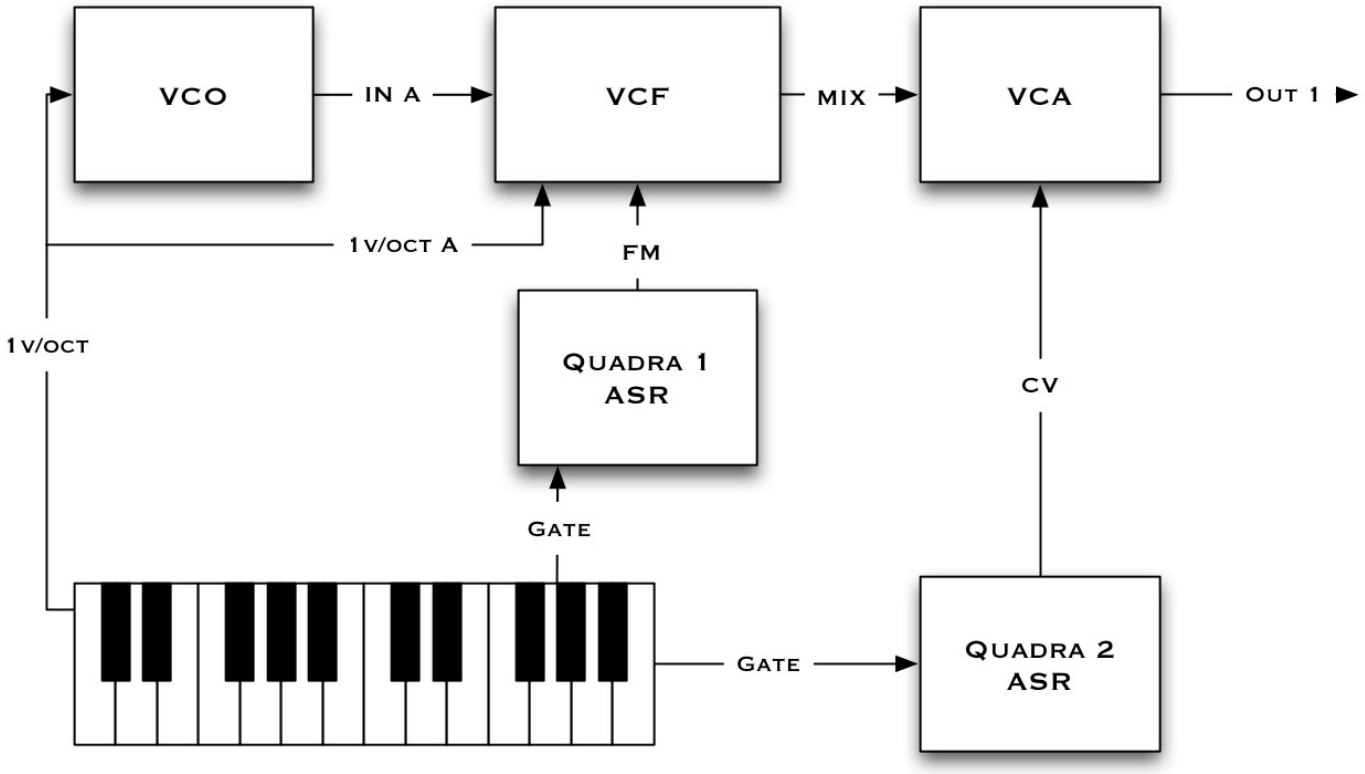
By using the OR output of the expander and triggering two function generators with the same gate signal an ADSR Envelope can be achieved. To do this use either OR output 1+2 or 3+4 on the expander. Send the same gate signal to the two function generators used. For example if using OR 1+2 Output send the gate signal to FG 1 and 2. Set FG 1 to AD mode and set FG 2 to ASR mode. When you layer them via the OR output you will get a ADSR envelope and you can use the OR level to control the Sustain level. Attack will be the OR of FG 1 and 2 Attack, Decay will FG 1 Decay and release will be FG 2 Decay.





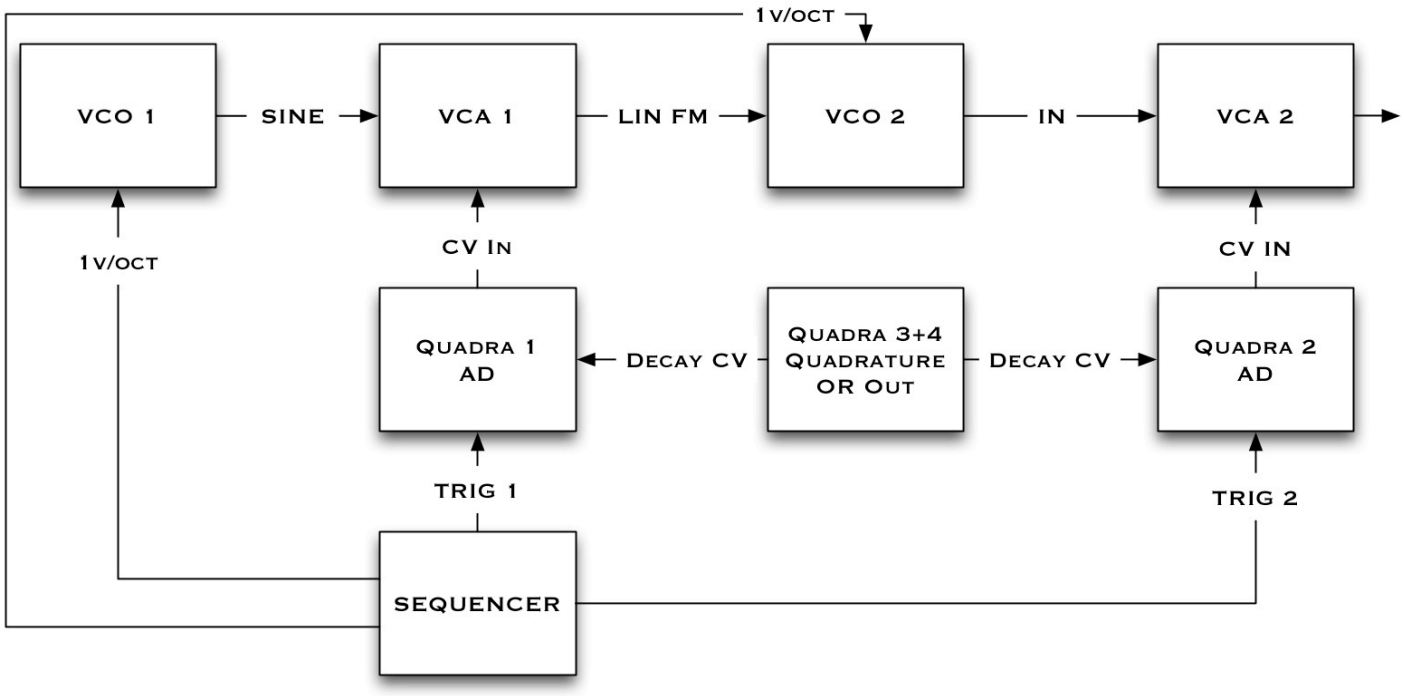
Patch Examples

Patch 1: Basic Voice with ASR Envelopes



This is a simple patch that uses the Quadra as two ASR envelope generators for a basic synthesizer voice. The reason ASR is chosen over AD in this example is that ASR will sustain as long as the keyboard key is held down. This is because a ASR envelope has a sustain section that stays high when the input gate is high. Once the keyboard key is released and the input gate goes low the Quadra will move to the Decay phase which in ASR mode is referred to as Release. ASR stands for Attack Sustain Release.

Patch 2: Basic West Coast Voice (uses Expander)

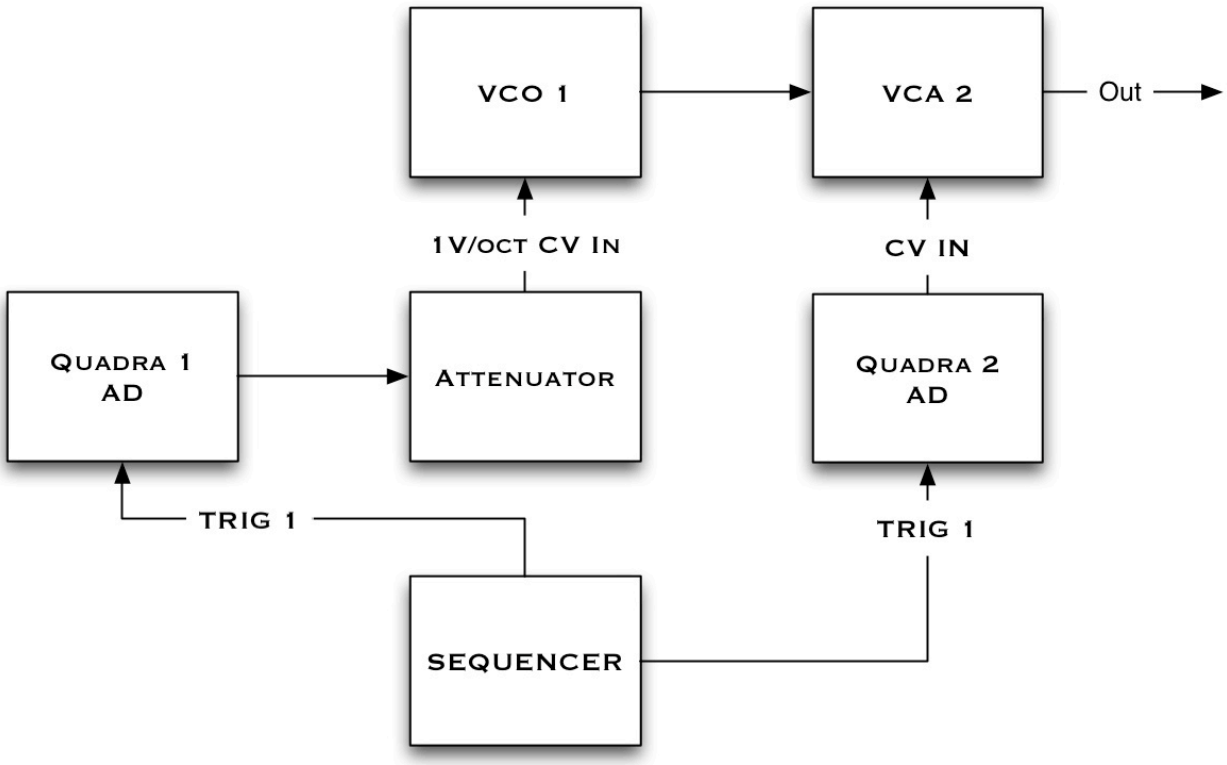


This patch uses the Expander for its CV inputs as well as Quadrature mode.

A simple example of what is referred to as a ”west coast” voice. As with most west coast style patching a filter is not used for timbre control, instead Linear FM is used in a two operator FM configuration. Quadra 1 controls the amount of harmonics by controlling VCA 1 level. Quadra 2 and VCA 2 are the final output volume. Make sure you adjust the pitch of VCO 1 to alter the harmonics produced by VCO 2.

Although a sequencer is used as an example a keyboard could be used. You should also try hooking up more LFOs and sequencers to various timbre shaping parameters such as VCO 1 pitch and the Quadra A and D CV inputs.

Patch 3: Kick Drum



This is a very simple patch that will create a nice snappy kick drum depending on the VCO you use. A self oscillating VCF can also be used, for example the Intellijel Korgasmatron makes excellent fat kicks with a bit of Q drive since it is not a true sine wave.

When doing this patch take the sine out of your VCO and patch it into your VCA. Patch the same trigger from a sequencer into both Quadra sections 1 and 2. Patch 1 through an attenuator and then into the pitch CV input of your VCO. The attenuator is needed to reduce the CV range of the Quadra, too much and the kick will sound like a zap instead of a snap. Both AD should be set to fast Attack and medium Decay to start. The Pitch AD should be shorter than the amplitude AD. To reduce clicks slow down the attack of the amp AD a bit, try starting at 9 o'clock. Adjust the pitch of your VCO and the attenuator until you get a nice boom tone. Then adjust the Quadra AD times until you get the shape of kick you desire.

For instructions on installing the Quadra Expander please view the following video:

https://www.youtube.com/watch?v=l24q07pOU-U

Support

Web: http://intellijel.com/

email: support@intellijel.com

Technical Specifications

Width: Quadra 12 HP, Expander 12 HP

Depth: 45mm

Power: 95mA @ -12V, 107mA @ +12V

Expected input: 5v peak to peak

Envelope Voltage Output: 0-8V

This modular device is intended to be used in the Eurorack standard modular system and its associated enclosures and power supply specifications.

Credits

Quadra circuit design: David G. Dixon and Danjel van Tijn

Eurorack conversion, PCB design and realization: Danjel van Tjin

Design consulting and beta testing: Haven Siguenza

Manual written by: Haven Siguenza, Danjel van Tjin, David G. Dixon